

A “bony” proposition: pathways mediating responses to simulated weightlessness and radiation

There is evidence that weightlessness and radiation, two elements of the spaceflight environment, can lead to detrimental changes in human musculoskeletal tissue, including bone loss and muscle atrophy. This bone loss is thought to be brought about by the increased activity of bone-resorbing osteoclasts and functional changes in bone-forming osteoblasts, cells that give rise to mature osteocytes. My current area of research focuses on understanding the mechanistic basis for the responses of bone to the spaceflight environment using earth-based animal and cellular models. The overarching goal is to identify molecular targets to prevent bone loss in space exploration and earth-based scenarios of radiotherapy, accidental radiation exposure and reduced mobility. In this talk, I will highlight two signaling pathways that potentially play a role in the response of bone to spaceflight-like conditions. Firstly, I will discuss the role of insulin-like growth factor 1 (IGF1) signaling as it pertains to the recovery of bone from simulated weightlessness (rodent hindlimb unloading model). Secondly, I will share recent findings from our study that aims to understand the emerging role of autophagy in maintaining the balance between bone formation and resorption (bone homeostasis) as well as normal skeletal structure.